Case Studies V: Fish Migration River: Monitoring Plan after Construction

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Fish Migration River - Monitoring plan after construction

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Presentation outline

1. Project Fish Migration River
2. Target species
3. Current fish migration opportunities
4. Monitoring questions
5. Monitoring methods
6. Proposed program
7. Research facility
8. Planning
1. Project Fish Migration River

- Afsluitdijk (closure dike) between Lake IJssel & Wadden Sea
- Tidal river fishway;
- Estuarine conditions;
- 5 km in length, 25m in width.
1. Project Fish Migration River

2. ‘natural part – marine side’
   - bottom: sand, rocks
   - With bird island and two separate channels

3. ‘Coupure’
   - In principle always open and accessible.
   - 100m length
   - 9m width canal
   - 3m width vertical slot
   - 3-5m deep
   - bottom: wrap wrap

4. ‘natural part – freshwater side’
   - bottom: sand, rocks

5. ‘technical part’
   - bottom: sand, rocks

6. Sluices
   - In principle always open and accessible.
   - Four gates, concrete, wooden doors, ‘rinkelten’ (dutch), vertical slot
2. Target species Fish Migration River

1. 3 groups of diadromous species
   A. Tidal migrants (passive transport)
      o European eel (juvenile stage);
      o Flounder Larvae;
   B. ‘Poor’ swimming capacity
      o Three spined stickleback (semi passive transport);
      o Smelt (semi passive transport);
      o Sea lamprey;
      o River lamprey;
   C. ‘Strong’ swimming capacity
      o North Sea Houting;
      o Twaite shad;
      o Allis shad;
      o Atlantic salmon;
      o Sea trout;

2. Estuarine species

3. Fresh water species
3. Current fish migration opportunity's

- **salmon, seatrout, houting, twaite shad**
  - Migration opportunity unsure. Migration may be facilitated through a potential saltwater undercurrent

- **sea lamprey, river lamprey**
  - Migration opportunity unsure

- **smelt, threespined stickleback**
  - Migration opportunity unsure

- **glass eel, flounder larvae**
  - Migration opportunity unsure

- **all species, all life stages**
  - Migration opportunity unsure

**Gates closed**

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**Night to Day**

**Water level waddensea**

**Water level IJsselmeer**

**Water velocity**

**Migration direction**

- **wad**
- **ljm**
4. Research questions monitoring plan

Q1: What is the overall passage efficiency of the Kornwerderzand complex per target species?

Q2: Is there a need for optimizing the functioning of the FMR and how can this be achieved?

Q3: Is the FMR also used as a habitat by fish and its predators?

Q4: What is the effectiveness of the FMR on fish population levels?
4. Research questions monitoring plan

Q1: What is the overall passage efficiency?

[Diagram showing the process of fish moving from Wadden Sea to Lake IJsselmeer, with steps 1 to 6 and efficiency calculations for different stages.]
5. Monitoring methods

- Combination of direct and indirect measurements.
- Tracking individuals with telemetry (large fish):
  - Acoustic telemetry (Vemco)
  - RFID telemetry (Nedap)
  - RFID telemetry (PIT-tag)
- Indirect (small fish):
  - Visual (Vaki/fish counter/Infra red)
  - Acoustic (Didson/Aris)
  - Trapping (fyke nets)
  - Lift nets
  - Beach seine
6. Proposed program

- T0 Pre construction and T1 and later.
6. Proposed program

- Example set up direct measurement Q1: Vemco
6. Proposed program

- Example set up direct measurement Q1: PIT-tag (left)
- Catching methods test fish for telemetry purposes (right)
6. Proposed program

- Example set up indirect measurement Q1: extensive netting program in combination with mark & recapture experiments
- Drift nets, lift nets & trawling
6. Proposed program

- Indication of delay, spatial dynamics and passage success for smaller fish, i.e. glass eel, stickleback, smelt and flounder larvae.

Lift nets & trawling
7. Research facility

- Little information available in literature on fish migration in the Wadden Sea.
- Parallel canals to perform on-site species specific research on:
  - Swimming capacity
  - Migration behaviour
- Controlled conditions for multiple parameters a.o. flow velocity, Q, entrance depth, substrate etc.

Flume BAW Karlsruhe. Photo: Wilco de Bruijne
8. Planning

<table>
<thead>
<tr>
<th>T0 pre construction phase</th>
<th>construction phase</th>
<th>T1 after construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-2</td>
<td>T-1</td>
<td>T0</td>
</tr>
<tr>
<td>Administration (e.g. permits)</td>
<td>Administration (e.g. permits)</td>
<td>no extensive measurements</td>
</tr>
<tr>
<td>Contracts fisherman</td>
<td>pilots method developing PITtag</td>
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</tr>
<tr>
<td>Pilot handling fragile fish (smelt, twaite shad, etc) for different purposes (VIE, VEMCO PITtag)</td>
<td>telemetry</td>
<td>optional: acclimatization experiments (ex situ)</td>
</tr>
<tr>
<td>Installing VEMCO receivers</td>
<td>extensive netting program</td>
<td>optional: pilot handling fragile fish (smelt, twaite shad, etc) for different purposes (VIE, PITtag)</td>
</tr>
<tr>
<td>Telemetry</td>
<td>mark recapture</td>
<td>PIT-tagging</td>
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<td>Extensive netting program</td>
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